

## How various cosmologies may affect the NGST science mission

- | The early design of NGST will be done before we have good empirical understanding about the cosmology of the Universe. Besides  $H_0$ , early evidence will come from:
  - » NICMOS deep fields will give us #counts and sizes of faints sources.
  - » ACS will go a magnitude deeper than the HDF
  - » SNe surveys will push to  $z=1$  (I band).
  - » SIRTf will measure sizes of early ellipticals to  $z=2-3$ .
- | But we need to plan for  $\sim 0$  or  $=1$  universes now!

# Comparing Flat and Open Cosmologies

## I Flat ( $\Omega = 1$ )

- » High z objects appear brighter, about 2 magnitudes at  $z=10$
- » High z objects appear larger,  $0.06 \text{ arcsec} = 250 \text{ pc}$  at  $z=10$ !
- » The angular density of high-z objects is two orders of magnitude lower. Rare objects (SNe or QSOs) become rare on the sky (ie  $< 1 \text{ sq degree}$ )
- » look-back time is high at high redshift ( $dt = (1+z)^{-5/2}$ )

## I Open ( $\Omega \sim 0$ )

- » High z objects are fainter, primarily due to doppler effects.
- » High z objects are constant size.  $0.06 \text{ arcsec} = 0.8 \text{ kpc}$  at  $z=10$ .
- » The angular density increases at high-z (linear with  $z$ )
- » look-back time increases as ( $dt = (1+z)^{-2}$ )
- »  $z=12$  corresponds to first 1 Gyr, same as  $z=4.2$  for flat universe.

# Different Strategies for Different Cosmologies

## I Flat ( $\Omega = 1$ )

- » Very Wide field surveys to shallower redshifts for SNe.
- » Medium surveys to shallow redshifts for protogalaxies.
- » Use other wide field surveys (X-ray or Radio) to locate rare QSO candidates.
- » Favors faster slew and settle times, very large field of view, lower resolution--possibly undersampled--and single slit, nebular spectrometers.

## I Open ( $\Omega \sim 0$ )

- » Medium surveys to higher redshifts for SNe and high-z QSOs.
- » Deep surveys to higher redshifts for Globular clusters and protogalaxies.
- » Requires large aperture telescope, higher resolution, low background, and an emphasis on multiaperture spectroscopy .

# Advantages of NGST vs. Ground for the two cosmologies

## I Flat ( $\Omega = 1$ )

- » Greater sensitivity permits ability to follow-up survey detections at higher spectral resolution.
- » Wider fields of view than the isoplanatic patch -- particularly for smaller aperture NGST (FOV can scale inversely with mirror diameter)
- » Ability to observe at wavelengths longer than 2.2 microns (earlier times).

## I Open ( $\Omega \sim 0$ )

- » Increased sensitivity compared to ground, particularly for very deep imaging.
- » Increasing numbers may lead to greater confusion, requiring high angular resolution
- » Ability to observe at wavelengths longer than 2.2 microns (earlier times).